US Army Corps
of Engineers ®
Walla Walla District

YAKIMA RIVER DELTA ECOSYSTEM RESTORATION

Final Feasibility Report with
Integrated Environmental Assessment

Appendix D

Cost Estimate Report

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW CERTIFICATION STATEMENT

For Project No. 494850

NWW – Yakima River Delta Ecosystem Restoration
Section 1135

The Yakima River Delta Ecosystem Restoration as presented by Walla Walla District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of August 15, 2024, the Cost MCX certifies the estimated total project cost:

FY24 Project First Cost:	$11,986,000
Fully Funded Total Project Cost:	$12,284,000
Federal Cost of Project:	$9,663,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management through the period of Federal participation.

Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Yakima Delta**
PROJECT NO: **494850**
LOCATION: **Richland, WA**

DISTRICT: **NWW**

PREPARED: **11/14/2023**

POC: **CHIEF, COST ENGINEERING, Mike Jacobs**

This Estimate reflects the scope and schedule in report; Yakima River Delta Ecosystem Restoration CAP Section 1135 Feasibility Report

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC):				2024					
						Effective Price Level Date:				1-Oct- 23					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	REMAINING COST ($K)	Spent Thru: 1-Oct-23 ($K)	TOTAL FIRST COST ($K)	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
09	CHANNELS & CANALS	$5,585	$2,550	46%	$8,135	5.0%	$5,866	$2,678	$8,543		$8,543	2.9%	$6,038	$2,756	$8,795
06	FISH & WILDLIFE FACILITIES			-		-						-			
				-		-						-			
				-		-						-			
	CONSTRUCTION ESTIMATE TOTALS:	$5,585	$2,550		$8,135	5.0%	$5,866	$2,678	$8,543		$8,543	2.9%	$6,038	$2,756	$8,795
01	LANDS AND DAMAGES	$78	$20	25%	$98	3.0%	$81	$20	$101		$101		$81	$20	$101
30	PLANNING, ENGINEERING & DESIGN	$1,706	$466	27%	$2,172	4.3%	$1,779	$486	$2,265		$2,265	0.4%	$1,787	$488	$2,275
31	CONSTRUCTION MANAGEMENT	$811	$222	27%	$1,033	4.3%	$846	$231	$1,077		$1,077	3.4%	$875	$239	$1,114
	PROJECT COST TOTALS:	$8,180	$3,257	40%	$11,437		$8,571	$3,415	$11,986		**$11,986**	2.5%	$8,780	$3,504	$12,284

_____	CHIEF, COST ENGINEERING, Mike Jacobs
_____	PROJECT MANAGER, Kat Herzog
_____	CHIEF, REAL ESTATE, Allison Needham
_____	CHIEF, PLANNING, XXX
_____	CHIEF, ENGINEERING, XXX
_____	CHIEF, OPERATIONS, XXX
_____	CHIEF, CONSTRUCTION, XXX
_____	CHIEF, CONTRACTING, XXX
_____	CHIEF, PM-PB, xxxx
_____	CHIEF, DPM, XXX

ESTIMATED TOTAL PROJECT COST:		**$12,284**
ESTIMATED FEDERAL COST:	**75%**	$9,213
ESTIMATED NON-FEDERAL COST:	**25%**	$3,071
22 - FEASIBILITY STUDY (CAP studies):		**$800**
ESTIMATED FEDERAL COST:	56%	$450
ESTIMATED NON-FEDERAL COST:	44%	$350
ESTIMATED FEDERAL COST OF PROJECT		**$9,663**

Filename: Yakima Delta CAP TPCS 14 Nov 2023 - CWCCIS Mar2024.xlsx
TPCS

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Yakima Delta
LOCATION: Richland, WA
This Estimate reflects the scope and schedule in report; Yakima River Delta Ecosystem Restoration CAP Section 1135 Feasibility Report

DISTRICT: NWW
POC: CHIEF, COST ENGINEERING, Mike Jacobs

PREPARED: 11/14/2023

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 6-Jul-23 Estimate Price Level: 1-Oct-22				Program Year (Budget EC): 2024 Effective Price Level Date: 1 -Oct-23								
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	Alt 3a. Full Causeway Removal													
09	CHANNELS & CANALS	$5,585	$2,550	45.7%	$8,135	5.0%	$5,866	$2,678	$8,543	2025Q1	2.9%	$6,038	$2,756	$8,795
06	FISH & WILDLIFE FACILITIES													
	CONSTRUCTION ESTIMATE TOTALS:	$5,585	$2,550	45.7%	$8,135		$5,866	$2,678	$8,543			$6,038	$2,756	$8,795
01	LANDS AND DAMAGES	$78	$20	25.0%	$98	3.0%	$81	$20	$101	2024Q1		$81	$20	$101
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	$140	$38	27.3%	$178	4.3%	$146	$40	$186	2024Q1		$146	$40	$186
1.0%	Planning & Environmental Compliance	$56	$15	27.3%	$71	4.3%	$58	$16	$74	2024Q1		$58	$16	$74
15.0%	Engineering & Design	$838	$229	27.3%	$1,067	4.3%	$874	$239	$1,113	2024Q1		$874	$239	$1,113
1.0%	Reviews, ATRs, IEPRs, VE	$56	$15	27.3%	$71	4.3%	$58	$16	$74	2024Q1		$58	$16	$74
1.0%	Life Cycle Updates (cost, schedule, risks)	$56	$15	27.3%	$71	4.3%	$58	$16	$74	2024Q1		$58	$16	$74
1.0%	Contracting & Reprographics	$56	$15	27.3%	$71	4.3%	$58	$16	$74	2025Q1	3.4%	$60	$16	$77
3.0%	Engineering During Construction	$168	$46	27.3%	$214	4.3%	$175	$48	$223	2025Q1	3.4%	$181	$49	$231
2.0%	Planning During Construction	$112	$31	27.3%	$143	4.3%	$117	$32	$149	2024Q1		$117	$32	$149
3.0%	Adaptive Management & Monitoring	$168	$46	27.3%	$214	4.3%	$175	$48	$223	2024Q1		$175	$48	$223
1.0%	Project Operations	$56	$15	27.3%	$71	4.3%	$58	$16	$74	2024Q1		$58	$16	$74
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$559	$153	27.3%	$712	4.3%	$583	$159	$742	2025Q1	3.4%	$603	$165	$768
2.0%	Project Operation:	$112	$31	27.3%	$143	4.3%	$117	$32	$149	2025Q1	3.4%	$121	$33	$154
2.5%	Project Management	$140	$38	27.3%	$178	4.3%	$146	$40	$186	2025Q1	3.4%	$151	$41	$192
	CONTRACT COST TOTALS:	$8,180	$3,257		$11,437		$8,571	$3,415	**$11,986**			$8,780	$3,504	**$12,284**

Filename: Yakima Delta CAP TPCS 14 Nov 2023 - CWCCIS Mar2024.xlsx
TPCS

Design Maturity Determination for Cost Certification

Date: 2/15/24
P2 Designation/Project Name: 464850 - Yakima Delta CAP1135

The Chief of Engineering is responsible for the technical content and engineering sufficiency for all engineering products produced by the command. As such, I have performed the Management Control Evaluation per Engineer Regulation (ER) 1110-2-1150, Engineering and Design for Civil Works Projects, Appendix H, Internal Management Control Review Checklist.

The current design DOES NOT require HQ approval (i.e., engineering waivers), requiring a deviation from mandatory requirements and mandatory standards, as defined in ERs, Engineering Manuals, Engineering Technical letters, and Engineering Circulars.

The current hydrology and hydraulics modeling is at 65 % design maturity, per reference (h) below.

The current geotechnical data and subsurface investigations are at 0 % design maturity, per reference (h) below. Subsurface investigations shall also include investigations of potential borrow and spoil areas.

The current survey data is at 50 % design maturity, per reference (h) below.

Other major technical and/or scope assumptions and risks include the following, which will be refined as the design progresses.

As detailed in the ARA, the likelihood of scope growth is possible which would have significant impact. The general engineering approach to project implementation is only broadly defined as summarized in Section 5.2 of the report with possible risk regarding construction elements. There is potential for changes in site conditions due to incomplete survey and geotechnical data. There are minimal concerns regarding earthwork quantity estimates for causeway removal, however the disposal site has not been confirmed and conservatively assumed the Richland Landfill at residential rates. There is residual risk regarding the need for select revetment countermeasures at and near the causeway, that have not been assessed or included in the costs. To meet fisheries BiOp requirements, all in-water work will be performed during window (Mid Nov- Feb) resulting in significant potential for poor weather and working conditions which could slow construction.

The largest scope risk is regarding the erosion of fine sediments after the causeway is breached and what requirements will be needed to control turbidity during/after construction. This could have a significant scope impact, requiring dredging/disposal with a mounted crane (with clamshell) and/or the construction of coffer cells.

Without a 30% design, acquisition risk is likely however the construction impact negligible as AE contractor pool is large.
Residual scope risk remains regarding the future of the marina and litigation without a detailed assessment of how this could change and whether structural countermeasures would be required to protect the anchorages.

The aggregate for all features is 10 % design maturity. Therefore, per the CECW-EC memorandum dated 05-June-2023, I certify that the design deliverables used to generate the cost products for this project and the estimate meet the requirements for a CLASS 3 estimate, as per reference (a) below. Design risks, impacts and remaining efforts are summarized on page 2.

Considering risks and assumptions noted above, along with all other concerns documented in the Risk Register, the Cost and Schedule Risk Analysis has developed a contingency of 40 % at the 80 % confidence level for the defined project scope.

Chief of Engineering & Construction

Duane A. West for Dwayne M Weston

Printed Name

Digitally signed by
WEST.DUANE.A.1231614091
Date: 2024.08.14 17:23:51 -07'00'

Signature

Design Maturity Determination for Cost Certification, Remaining Work

If an engineering waiver is required, list the risks and remaining design work needed to mitigate this issue in the current design. Identify remaining effort to complete the design required for 100% design.

An engineering waiver is not required.
As detailed in subsequent sections, the remaining effort to complete the 100% design includes:
1. Acquire recommended survey and geotechnical data.
2. Advance sediment assessment and determine scope impacts.
3. Complete recommended design level geotechnical and hydraulic assessments
4. Complete grading plan and revetment design.
5. Develop full PS&E package with DDR per BCOES.

Identify remaining effort to complete geotechnical design effort required for 100% design. List the risks and cost and schedule impacts needed to mitigate this issue in the current design.

The primary civil design feature of the recommend plan is removal of the ~800 lf Bateman Island causeway via excavation of ~40 kcy of material. The feasibility grading footprint was selected to minimize excavation into intact sections of the shoreline and island with limited grading to tie-in side slopes and the channel inverts.
Geotechnical risks were provisionally estimated to be low for this project and thus no geotechnical tasks were scoped for the feasibility phase. Despite low risk, standard geotechnical design considerations to be evaluated during PED include:
1. Subsurface site investigation of causeway and select side slopes both above OHWM and submerged as recommended by PED geotechnical engineer to inform need for revetment bench with launchable toe.
2. Bearing capacity assessment of select project areas to validate construction activity surcharge due to heavy equipment operating on the causeway cross section.
3. Field investigation to map thickness of fine sediment deposition to the south and west of Bateman Island to inform construction and post-construction sediment management plan such as dredging or stabilization.
4. Additional geotechnical exploration and/or design analysis would be required in the event that project scope expands to include protection of the marina.

Identify remaining effort required to complete H&H required for 100% design. List the risks and cost and schedule impacts needed to mitigate this issue in the current design.

Hydrology: The overall H&H on this project is well quantified as the Columbia and Yakima River inflows are both hydro-regulated, and the downstream stage is influenced by McNary pool operations on the Columbia with surcharge of Ice Harbor outflows on the Snake. While there is some residual hydrologic risk as discussed in the climate change appendix, it is low and not expected to influence project stability.
Hydraulics: The hydraulic models used for feasibility are of scaled fidelity and used regional RAS1D models to route forcings to the 2D model boundary. There are detailed 2D models of baseline conditions and the recommended plan in both RAS2D and AdH2D, that have been evaluated over a limited set of index forcings and select water years. The project site is within a large volume system with significant inertia and dampened hydraulics due to downstream hydroregulation. Recommend updating hydraulic models during PED to iterate and validate select design criteria.
Sediment: Accumulated fine sediments to the west of Bateman Island remain a concern as they are expected to erode during and post construction and will require a sediment management plan that could extend into the near term (next 10 years) timeframe. The sediment contribution area in the delta is ~200 acres that could generate ~325 kcy of sediment slurry per foot of eroded depth. The NFS independently scoped an AE to conduct a screening/feasibility level assessment to identify patterns of sediment erosion, dispersion, and deposition in the Yakima Delta project reach. The AE developed a particle tracking model from the 2D hydraulic model and evaluated the potential impacts of sediments being mobilized following causeway removal. A cursory district review found the study to be sound, fulfilling the Stage 1 (reconnaissance level) requirements as well as an initial Stage 2 (feasibility level) detailed sedimentation study per ER 1110-2-8153. The Stage 2 sediment assessment should be advanced early in PED to quantify erosion/deposition volumes over a wider range of flows and identify design/construction features needed to address sediment risks.
The PTM results indicate that some erosion of the delta sediments would occur and transport downstream with seasonal high flows and that residual sediment is expected to be incrementally exposed and mobilized in annual floods for many years. The report notes that the PTM results will be used to evaluate the impacts from chemicals of potential concern being mobilized from the sediments following removal of the causeway.
Residual risks for management of sediments eroded from the delta remain a concern. Advancing the sediment study is recommended to quantify the erosion/deposition volumes and determining the timescales of expected probability for the delta to stabilize.

H&H design considerations to be resolved during PED include:

1. Hydrology – low risk.
a. Evaluate latest hydrologic frequency curves for current system policy operations such as post CRT-2024, and BiOp spill criteria, and USBR Yakima water supply regulation that could change low probability forcings criteria at project site.
2. Hydraulics – low risk.

Identify remaining effort needed to complete survey data required for 100% design. List the risks and cost and schedule impacts needed to mitigate this issue in the current design.

Survey datasets used for feasibility were comprised of overbank lidar and a mosaic of various bathymetric datasets as documented in Table D-3-1. The lidar was 2010 era, and the Columbia River was 2017 era multibeam. For the Yakima River delta, and west of the Bateman Island causeway, the bathymetric data quality is poor and was derived from sparse 2015 era single beam data sans qa/qc. Bathymetric uncertainty for the delta remains a residual risk, especially regarding the volume of fine material supply that will be eroded during and post-construction.
Survey data to be scoped and collected during PED include:
1. Collect site specific survey data and/or updated Lidar at the causeway site above OHWM.
2. Collect bathymetric survey data for the Yakima River delta, including areas west of Bateman Island that are subject to future erosion in accordance with EM 1110-2-1003.
3. Confirm/conduct any property boundary surveys as needed.
4. Support geotechnical field investigation to map thickness of fine sediment deposition to the south and west of Bateman Island.

If the project is anticipated to be executed in parts, provide a design assessment (percent complete) of each part/phase below.

References:

a. ER 1110-2-1302 – Civil Works Cost Engineering
b. CECW-EC memorandum dated 05-June-2023MFR, Guidance on Cost Engineering Products update for Civil Works Projects in accordance with Engineer Regulation 1110-2-1302 – Civil Works Cost Engineering
c. ER 1165-2-217 – Civil Works Review Policy
d. ER 1110-2-1150 – Engineering and Design for Civil Works Projects
e. ER 1110-3-12 – Quality Management
f. ER 1110-345-700 – Design Analysis, Drawings and Specifications
g. EM 5-1-11 – Project Delivery Business Process (PDBP)
h. Engineering and Construction Bulletin (ECB) 2023-9 – Civil Works Design Milestone Checklists

Design Maturity Determination for Cost Certification – Instructions

Paragraph 1 – Design Date: Use the drop-down menu to populate the date of the design.

Paragraph 1 – Project Information: Enter the P2 Project number and Project name.

Paragraph 3 – Engineering Waivers: Use the drop-down menu to populate this field with either "Does," or "Does not." If an engineering waiver is needed, or anticipated to be needed, provide the specific waiver required for the Project. A waiver is any deviation from current mandatory standards, as indicated.

Paragraph 4 – Hydrology and Hydraulics: Populate this field with the % design maturity.

Paragraph 5 – Geotechnical Information: Populate this field with the % design maturity.

Paragraph 6 – Survey Data: Populate this field with the % design maturity.

Paragraph 7 – Other Technical Assumptions and/or Scope: Enter any other major technical assumptions or scope assumptions here. Only include assumptions that pertain to design. Template discussion fields are provided as a courtesy. Please include additional pages as necessary.

Paragraph 8 – Signature: Print the name and title and provide the signature for the District's Chief of Engineering. This authority cannot be delegated; however, the Deputy Chief of Engineering and Design may sign the form in the absence of the Chief of Engineering. All fillable fields must be populated (use N/A if not applicable) in order for the document to be signed.

Page 2 – Remaining Work: Identify the current baseline design assumptions and the remaining design effort and risks to complete 100% design for the authorized project. If the project is to be broken into parts or phases, provide details on the aggregate design level of each phase and anticipated timeline for completion.

This form is required for all Civil Works projects for initial Cost Certification and Recertification, based on Policy Clarification MFR dated 05 June 2023, *Guidance on Cost Engineering Products update for Civil Works Projects in accordance with Engineer Regulation 1110-2-1302 – Civil Works Cost Engineering*.
The Point of Contact for this action is Mr. Mukesh Kumar, Cost Engineering Community of Practice Leader, CECW-EC, Mukesh.Kumar@usace.army.mil.
Version 1: 01 October 2023.